

# Appendix R. Fluid Compressibility Calculation

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## Scope

The investigation team reviewed real-time data and witness accounts to determine if the volume measurements during the negative-pressure test exceeded expected values based on calculated compressibility of seawater and synthetic oil-based mud (SOBM) in the wellbore.

## Finding

At the start of the negative-pressure test, the drill pipe pressure was 1,200 psi. The pressure in the drill pipe was bled off to atmospheric conditions, and approximately 15 bbls of seawater flowed from the drill pipe at 17:27 hours on April 20, 2010.

The wellbore system (comprising the drill pipe in the riser, the kill line and the wellbore) contained 477 bbls of seawater and 508 bbls of SOBM. The volume of fluid expected to be recovered from the system is equivalent to the volume of fluid required to increase the pressure on the system.

The calculated volume required to compress 477 bbls of seawater to 1,200 psi is 1.7 bbls. The calculated volume required to compress 508 bbls of SOBM to 1,200 psi is 2 bbls. (Refer to Figure 1 and Figure 2). Therefore, the calculated total volume to compress the system to 1,200 psi is 3.7 bbls, but 15 bbls were recovered.

## Conclusion

The investigation team concluded that if approximately 15 bbls of fluid were recovered from the system, well inflow had to have been present, since the calculated compressibility of the system was 3.7 bbls.


 <b>Quick Fluid Compressibility</b>																												
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<b>Inputs:</b>	MC 252 Seawater Compressibility for 1200 psi for negative test																											
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Figure 1. Seawater Compressibility Calculations.


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Figure 2. SOBM Compressibility Calculations.